

The documentation and process conversion measures necessary to comply with this revision shall be completed by 8 September 2015.

INCH-POUND

MIL-PRF-19500/656B
8 June 2015
SUPERSEDING
MIL-PRF-19500/656A
4 June 2008

*

PERFORMANCE SPECIFICATION SHEET

DIODE, SILICON, SCHOTTKY,
POWER RECTIFIER, COMMON CATHODE OR COMMON ANODE CENTER TAP,
TYPES 1N6785 AND 1N6785R, JAN, JANTX, JANTXV AND JANS

This specification is approved for use by all Departments
and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of
this specification sheet and [MIL-PRF-19500](#).

1. SCOPE

* 1.1 Scope. This specification covers the performance requirements for a silicon, Schottky, power rectifier diode. Four levels of product assurance are provided for each device (JAN, JANTX, JANTXV, and JANS) type as specified in [MIL-PRF-19500](#).

* 1.2 Package outlines. The device package outlines are as follows: TO-257AA in accordance with [figure 1](#) for all encapsulated device types.

1.3 Maximum ratings. Unless otherwise specified $T_A = +25^\circ\text{C}$.

Type	V_R (1)	V_{RWM} (1)	I_O (1) (2) (3)	I_{FSM} (1) $T_C = +25^\circ\text{C}$ $t_p = 8.3 \text{ ms}$	C_J at 5 V (1)	$R_{\theta JC}$ (1)	$R_{\theta JA}$ (1)	T_{STG} and T_J
			$T_J = T_C = +100^\circ\text{C}$			$^\circ\text{C/W}$	$^\circ\text{C/W}$	
	<u>V</u>	<u>V</u>	<u>A dc</u>	<u>A(pk)</u>	<u>pF</u>			<u>$^\circ\text{C}$</u>
1N6785, 1N6785R	45	45	15	150	2,000	1.65	40	-65 to +150

- (1) Each individual diode.
- (2) Derate linearly at 300 mA/ $^\circ\text{C}$ from $T_J = T_C = +100^\circ\text{C}$ to $+150^\circ\text{C}$; 300 mA/ $^\circ\text{C}$ times $50^\circ\text{C} = 15 \text{ A}$, the device rating.
- (3) Total package current is limited to 30 A dc.

* Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to Semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

AMSC N/A

FSC 5961



- * 1.4 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.4](#) for PIN construction example and [6.5](#) for a list of available PINs.
- * 1.4.1 JAN certification mark and quality level for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX", "JANTXV" and "JANS".
- * 1.4.2 Device type. The designation system for the device types of diodes covered by this specification sheet are as follows.
- * 1.4.2.1 First number and first letter symbols. The diodes of this specification sheet use the first number and letter symbols "1N".
- * 1.4.2.2 Second number symbols. The second number symbols for the diodes covered by this specification sheet are as follows: "6785".
- * 1.4.3 Suffix symbols. The suffix letter "R" is used on devices that are reverse polarity of the no suffix devices (see [figure 1](#)).

2. APPLICABLE DOCUMENTS

- * 2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATIONS

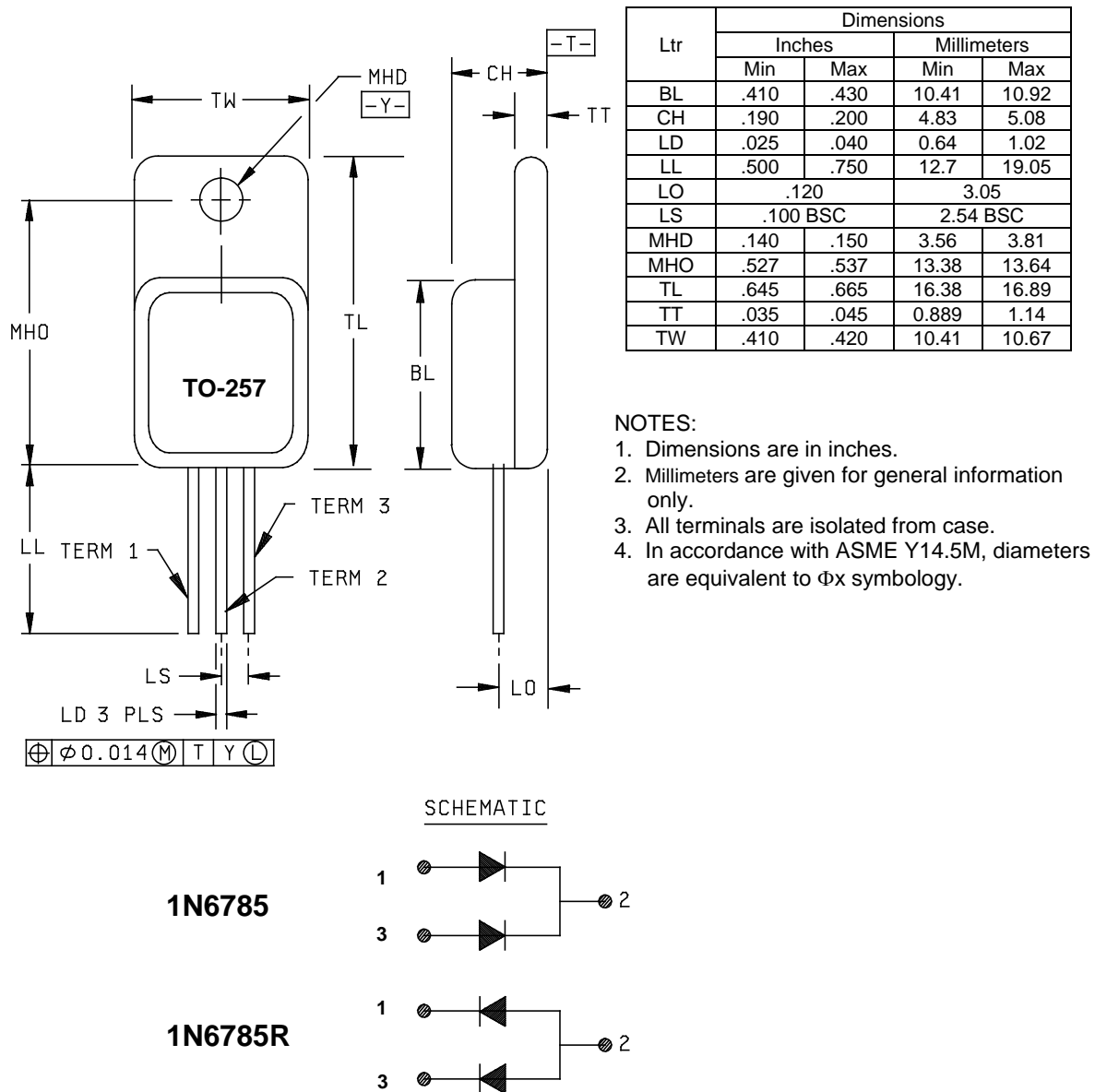
[MIL-PRF-19500](#) - Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) - Test Methods for Semiconductor Devices.

- * (Copies of these documents are available online at <http://quicksearch.dla.mil/>).

2.3 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

FIGURE 1. Physical dimensions and configuration (TO-257AA).

3. REQUIREMENTS

3.1 General. The individual item requirements shall be as specified in [MIL-PRF-19500](#) and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list (QML) before contract award (see [4.2](#) and [6.3](#)).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in [MIL-PRF-19500](#).

3.4 Interface and physical dimensions. The interface and physical dimensions shall be as specified in [MIL-PRF-19500](#) and on [figure 1](#) (TO-257AA) herein. Methods used for electrical isolation of the terminal feedthroughs shall employ materials that contain a minimum of 90 percent AL_2O_3 (ceramic). Examples of such construction techniques are metallized ceramic eyelets or ceramic walled packages.

3.4.1 Lead finish and formation. Lead finish shall be solderable as defined in [MIL-PRF-19500](#), [MIL-STD-750](#), and herein. Where a choice of lead finish or formation is desired, it shall be specified in the acquisition requirements (see [6.2](#)).

3.4.2 Polarity. Polarity and terminal configuration shall be in accordance with [figure 1](#) herein.

3.5 Marking. Marking shall be in accordance with [MIL-PRF-19500](#).

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [table I](#).

3.7 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see [4.2](#)).
- b. Screening (see [4.3](#)).
- c. Conformance inspection (see [4.4](#), and [tables I, II, and III](#)).

4.2 Qualification inspection. Qualification inspection shall be in accordance with [MIL-PRF-19500](#).

- * 4.2.1 Group E qualification. Group E inspection shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not request the performance of [table II](#) tests, the tests specified in [table II](#) herein that were not performed in the prior revision shall be performed by the first inspection lot of this revision to maintain qualification.

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table E-IV of MIL-PRF-19500, and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table E-IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3c	Method 3101 (see 4.3.2), peak reverse energy test (see 4.3.3)	Method 3101 (see 4.3.2), peak reverse energy test (see 4.3.3)
9 and 10	Not applicable	Not applicable
11	V_{F2} and I_{R1}	V_{F2} and I_{R1}
12	See 4.3.1, $t = 240$ hours	See 4.3.1, $t = 48$ hours
13	Subgroups 2 and 3 of table herein; $\Delta V_{F2} = \pm 50$ mV; $\Delta I_{R1} = 100$ percent of initial value or ± 250 μ A dc, whichever is greater.	Subgroup 2 of table herein; $\Delta V_{F2} = \pm 50$ mV; $\Delta I_{R1} = 100$ percent of initial value or ± 250 μ A dc, whichever is greater.

- * (1) Shall be performed anytime after temperature cycling, screen 3a. JANTX and JANTXV levels do not need to be repeated in screening requirements.

4.3.1 Power burn-in conditions. Burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A. $T_C = +125^\circ\text{C}$; $V_R = 36$ V dc.

4.3.2 Thermal impedance $Z_{\Theta JX}$ measurements for screening. The $Z_{\Theta JX}$ measurements shall be performed in accordance with method 3101 of MIL-STD-750. Test each die separately. The maximum limit and conditions for $Z_{\Theta JX}$ in screening (table E-IV of MIL-PRF-19500) shall be derived by each vendor by means of process control of actual measurements which characterizes the die attach process. When three lot date codes have exhibited control, the data from these three lots will be used to establish a fixed screening limit (not to exceed the group A limit). Once a fixed limit has been established, monitor all future sealing lots using a sample from each lot to be plotted on the applicable statistical process chart.

4.3.2.1 Thermal impedance ($Z_{\Theta JX}$ measurements) for initial qualification or requalification. The $Z_{\Theta JX}$ measurements shall be performed in accordance with MIL-STD-750. Method 3101 (read and record date $Z_{\Theta JX}$) derived conditions limits and thermal response curve shall be supplied to the qualifying activity on the qualification lot prior to qualification approval.

4.3.3 Peak reverse energy test. The peak reverse energy test is to be performed using the circuit as shown on figure 2 or equivalent. The Schottky rectifier under test must be capable of absorbing the reverse energy, as follows: $I_{RM} = 2$ A minimum, $V_{RSM} = 45$ V dc minimum, $L = 260$ μ H.

4.4 Conformance inspection. Conformance inspection shall be in accordance with [MIL-PRF-19500](#) and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of [MIL-PRF-19500](#), and [table I](#) herein. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein. The following test conditions shall be used for $Z_{\Theta JX}$, group A inspection:

- a. I_M measure current - - - - - 10 mA.
- b. I_H forward heating current - - - - - 15 - 50 A.
- * c. t_H heating time - - - - - 50 ms.
- * d. t_{MD} measurement delay time - - - 100 μ s minimum.

The maximum limit for $Z_{\Theta JX}$ under these test conditions are $Z_{\Theta JX}(\max) = 1.55^\circ\text{C/W}$.

- * 4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIA (JANS) and E-VIB (JAN, JANTX and JANTXV) of [MIL-PRF-19500](#), and as follows. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein.

4.4.2.1 Group B inspection, table E-VIA (JANS) of [MIL-PRF-19500](#).

	<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
*	B4	1037	I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C
*	B5	1038	Condition A, $T_J = T_C = +150^\circ\text{C}$, $V_R = 36$ V dc
*	B6	3101	$R_{\Theta JC} = 1.65^\circ\text{C/W}$ maximum for each die.

- * 4.4.2.2 Group B inspection, table E-VIB (JAN, JANTX and JANTXV) of [MIL-PRF-19500](#).

	<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
*	B3	1037	I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C .
*	B5	3101	$R_{\Theta JC} = 1.65^\circ\text{C/W}$ maximum for each die.

- * 4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VII of [MIL-PRF-19500](#), and as follows. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein.

	<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
*	C2	2036	Test condition A, weight = 10 pounds, t = 15 seconds.
*	C6	1037	I_F or $I_O = 2$ A (minimum); $\Delta T_J \geq 85^\circ\text{C}$, $+15^\circ\text{C}$, -5°C

- * 4.4.4. Group E Inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-IX of [MIL-PRF-19500](#) and as specified herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurements shall be as specified in section 4 of [MIL-STD-750](#).

4.5.2 Thermal resistance. Thermal resistance shall be measured as follows in accordance with method 3101 or 4081 of [MIL-STD-750](#). Each diode leg shall be measured.

- a. I_H ----- 15 - 50 A.
- b. I_M ----- 10 mA.
- c. $R_{\theta JC}$ --- 1.65°C/W.
- d. t_{Md} ---- 100 μs maximum.

TABLE I. Group A inspection.

Inspection <u>1/ 2/</u>	MIL-STD-750		Symbol	Limit		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical inspection	2071					
<u>Subgroup 2</u>						
Thermal impedance	3101	See 4.3.2	$Z_{\Theta JX}$		1.55	°C/W
Forward voltage	4011	$I_F = 5$ A (pk) pulsed (see 4.5.1)	V_{F1}		0.55	V dc
		$I_F = 15$ A (pk) pulsed (see 4.5.1)	V_{F2}		0.75	V dc
		$I_F = 30$ A (pk) pulsed (see 4.5.1)	V_{F3}		1.0	V dc
Reverse current	4016	DC method, $V_R = 45$ V dc, (see 4.5.1)	I_{R1}		1.0	mA dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +125^\circ\text{C}$				
Reverse current leakage	4016	DC method, pulsed (see 4.5.1)				
		$V_R = 45$ V	I_{R2}		40	mA dc
Low temperature operation:		$T_A = -55^\circ\text{C}$				
* Forward voltage	4011	Pulsed (see 4.5.1), condition B, $I_F = 15$ A (pk)	V_{F4}		0.8	V dc
<u>Subgroup 4</u>						
Junction capacitance	4001	$V_R = 5$ V dc; $f = 1$ MHz, $V_{SIG} = 50$ mV (p-p) (max)	C_J		2,000	pF
<u>Subgroup 5</u>						
Dielectric withstanding voltage	1016	$V_R = 500$ V dc; all leads shorted; V measure from leads to case; sample is $n = 116$, $c = 0$	DWV		10	μA
<u>Subgroup 6 and 7</u>						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.

2/ Each individual diode.

*

TABLE II. Group E inspection (all quality levels) for qualification only.

Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			
Thermal shock (temperature cycling)	1051	500 cycles	45 devices, c = 0
Hermetic seal	1071		
Electrical measurements		See table III , steps 1, 2, and 5	
<u>Subgroup 2</u>			45 devices, c = 0
Steady-state blocking life	1048	t = 1,000 hours, T _C = +125°C; V _R = 36	
Electrical measurements		See table III , steps 1 and 2	
<u>Subgroup 3</u>			
Not applicable			
<u>Subgroup 4</u>			N/A
Thermal impedance curves	3101	See MIL-PRF-19500 .	
<u>Subgroup 10 1/</u>			22 devices, c = 0
Surge	4066	Condition B; T _A = +25°C; I _{FSM} = 150 A, 100 surges	
Electrical measurements		See table III , steps 1 and 2.	

1/ For each diode.

* TABLE III. Groups A, B, C, and E delta end-point measurements. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = 15$ A (pk), pulsed (see 4.5.1)	ΔV_{F2}	± 50 mV dc from initial reading.		
2.	Reverse current	4016	$V_R = 45$ V dc, pulsed (see 4.5.1) DC method	ΔI_{R1}	± 250 μ A dc or 100 percent from initial reading, whichever is greater.		
3.	Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$		1.55	$^{\circ}\text{C/W}$

1/ Each individual diode.

2/ The delta measurements for table E-VIA (JANS) of MIL-PRF-19500 are as follows:

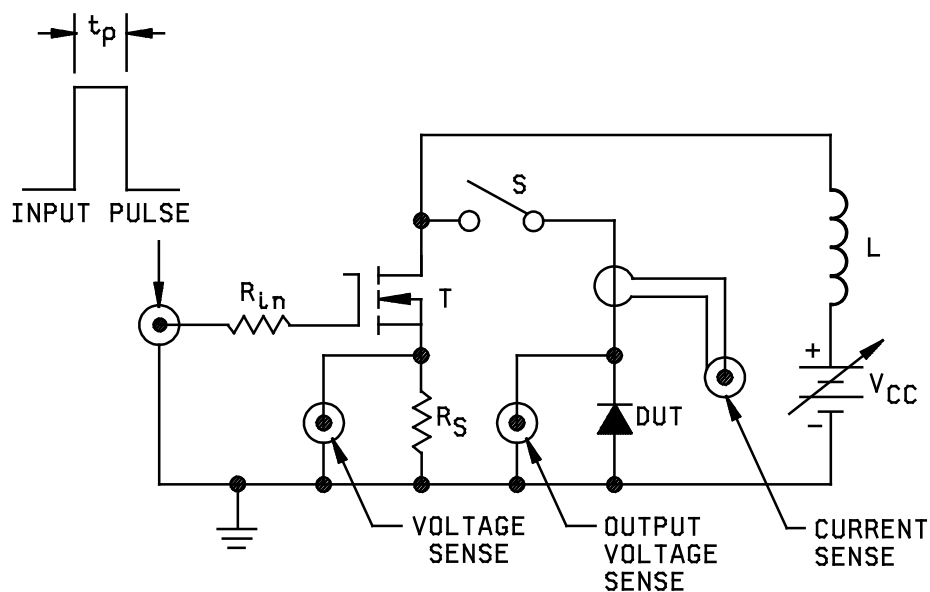
- a. Subgroup 4, see table III herein, steps 1, 2, and 3.
- b. Subgroup 5, see table III herein, step 3.

3/ The delta measurements for table E-VIB (JAN, JANTX and JANTXV) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table III herein, step 3.

4/ The delta measurements for table E-VII of MIL-PRF-19500 are as follows:

- b. Subgroup 6, see table III herein, step 3 for all levels.



Input pulse	$R_{in} = 50 \text{ ohms, 1 watt}$
$V_G = 10 \text{ Volts}$	$R_S = 0.1 \text{ ohms, 1 watt}$
$R_G = 50 \text{ ohms}$	$V_{CC} \approx 10 \text{ volts}$
P.W. $\approx 30 \mu\text{s}$	$L = 260 \mu\text{H}$
Duty cycle $\leq 1 \text{ percent}$	$T = \text{IRF130/2N6756 or equivalent}$

Procedures:

1. With S open, adjust pulse width to test current of 2 amps across R_S .
2. Close S, verify test current with current sense.
3. Read peak output voltage (see 4.3.3).

FIGURE 2. Peak reverse energy test circuit.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in MIL-PRF-19500 are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

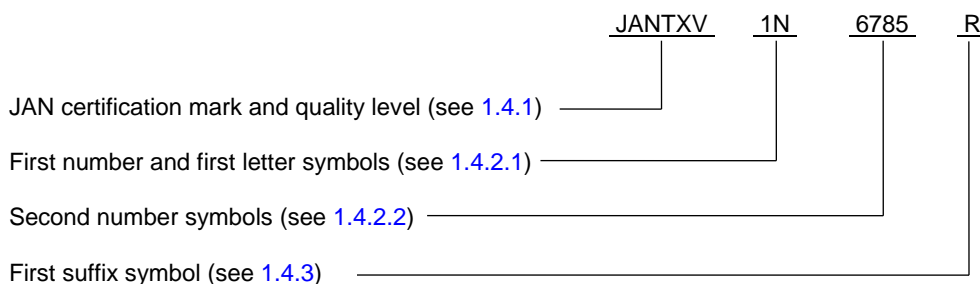
6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- * d. The complete Part or Identifying Number (PIN), see 1.4 and 6.4.

* 6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

* 6.4 PIN construction example.

* 6.4.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.



- * 6.5 List of PINs. The following is a list of possible PINs available on this specification sheet.

PINs for types1N6785
JAN1N6785..... (1)
JANTX1N6785 (1)
JANTXV1N6785.....(1)
JANS1N6785(1)

(1) Add "R" suffix for reverse polarity devices.

6.6 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
 Army - CR
 Navy - EC
 Air Force - 85
 NASA - NA
 DLA - CC

Preparing activity:
 DLA - CC

(Project 5961-2015-035)

- * NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil>.